


**OLIY TA'LIM
TARAQQIYOTI ISTIQBOLLARI**

**PERSPECTIVES OF HIGHER
EDUCATION DEVELOPMENT**

**ПЕРСПЕКТИВЫ РАЗВИТИЯ
ВЫСШЕГО ОБРАЗОВАНИЯ**

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OLIV TA'LIM TARAQQIYOTI ISTIQBOLLARI

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FOREWORD

In issue No. 15 of the journal "Perspectives of Higher Education Development," articles are presented that address various aspects of higher education development: from the successful results of project implementation under the ERASMUS+ Programme in different universities of the country and abroad, to the current tasks of integrating artificial intelligence into educational and research processes.

Currently, more and more university leaders are interested in scientometric services, the results of which include monitoring research activities, analyzing scientometric indicators and university positions in international rankings, providing analytical support for organizational leadership activities, and more. An interesting article by A.V. Khalyukov and K.S. Khalyukova discusses consulting and expert services in the field of scientometrics for assessing the research performance of employees and the university itself. The information-analytical internet service ID SCIENCE, which provides access to search for scientific identifiers of researchers, scientific journals, and organizations, is described. We believe that this experience will be useful for the heads of university research departments.

Academician H.A. Mamadjanov's article analyzes the state of inventive activity in the Republic of Uzbekistan in the context of the global patent system and its impact on economic development. He addresses current problems faced by researchers and organizations in creating and using intellectual assets. According to the author, the country needs to pay more attention to training specialists in intellectual property (IP) management: organizing accelerated courses on invention, patenting, utilization, licensing, and protection of IP; and preparing specialists (lawyers, economists, managers for the field of innovation activity and IP management) through master's programs in the local leading universities.

Professor Shohmansur Shokhazamiy is becoming one of our regular authors, publishing articles distinguished by a wide range of topics and ideas on higher education reform (I recommend reading his articles in issues No. 13-14). In issue No. 15 of our journal, the author presents another interesting perspective on developing a scientifically grounded concept for comprehensively addressing the tasks of the higher education market (HEM) and labor market (LM), integrating with the public, economy, and state policy of socio-economic development of the country. Within the framework of the doctrine, the theoretical and methodological foundations of the inseparable pair "HEM-LM," mission, vision, priority, main goal, tasks, advantages, specific paths, mechanisms, and prospects for implementing the proposed strategy concept in the context of the development of New Uzbekistan are defined and substantiated.

Currently, no serious conference or reputable journal goes without covering materials related to artificial intelligence (AI). The active development of AI technology in the last two or three years has begun to significantly impact the field of education and research. The article by young scientist Igor Vikrov provides experience in applying AI technologies in the educational and research process at a medical university, using the example of the Tashkent Pediatric Medical Institute. Conclusions and recommendations for the effective implementation of AI technologies in the educational and research process of the university are formulated.

Original research results are presented in the article by Botir Usmonov, Rector of the Tashkent Chemical-Technological Institute, on the application of the fuzzy logic method for measuring and classifying university performance results. In the future, using such an approach may allow for a more objective assessment of the activity and ranking of universities.

Dear researchers, university lecturers, doctoral candidates, and students, we look forward to receiving your new scientific and methodological articles, as well as reports on project implementation experiences for higher education development. On the website www.erasmusplus.uz you will find article requirements and a complete archive of the journal available for open access.

***Chief Editor, Professor,
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RESEARCH OF REACTIVE POWER CONSUMPTION OF SINGLE-PHASE ASYNCHRONOUS MOTOR ENERGY SUPPLIED BY SOLAR PANELS (ERASMUS+ DEBSEUZ PROJECT ACTIVITY)

Siddikov Ilhomjon, Azamov Saidikrom, Berdiyev Dilshod

Abstract: This scientific article was supplemented with the results of research solutions obtained within the framework of the project 101128871-ERASMUS-EDU-2023-CBHE “Development of the targeted Educational program for Bachelors in Solar Energy in Uzbekistan” (DEBSEUZ, 2023-2026 y.y.). Global demand for renewable energy sources is increasing day by day, including environmentally friendly, easy to install and maintain, and taking into account the fact that the sun shines more than three hundred days a year it is great to provide the energy produced by solar panels to the consumers of manufacturing enterprises and households it is noted that in this regard, the implementation of on-grid and off-grid systems for providing consumers with continuous energy, the introduction of systematic control and management methods of the quality indicators and quantity of generated electricity, and their practical application are considered to be the main issues. More than 55-60 percent of the generated electricity are using by one -and three-phase asynchronous motors, which are considered as consumers, providing these electrical devices with high-quality electricity, controlling the consumption of reactive power that creates a magnetic field and current in asynchronous motors research of electromagnetic current converters, which allow for the evaluation of reactive power and electric current asymmetry and non-sinusoidal indicators, remote measurement of these quantities with appropriate devices, control and conversion to a standard signal, are considered urgent issues.

Key words: Asynchronous motor, electromagnetic current converter, stator windings, reactive power, symmetrical, non-sinusoidal, converter, electromagnetic, solar panels, batteries, sensitivity.

Introduction

If will paid attention to the whole world’s experience in talking about the advantages of solar energy sources, according to the calculations of international organizations, due to economic development, the demand for energy will increase by 50 percent by 2030 compared to the beginning of our century, and the total need 23, which is 27 billion tons of conventional fuel [1].

It is known from the analyzes and research that at the moment, a number of scientific research works are being carried out to control and manage the reactive power consumption of asynchronous motors, which are considered the main consumers of electricity produced by the production enterprises of republic and the solar panels installed in the houses of the residents, but these problems have not been sufficiently studied for asynchronous motors powered by a phases of solar energy source [2-5].

Allows to accurately and reliably change and control magnetic currents. The research scheme of a three-phase asynchronous motor supplied from a single-phase power supply nets is presented in Fig.1.

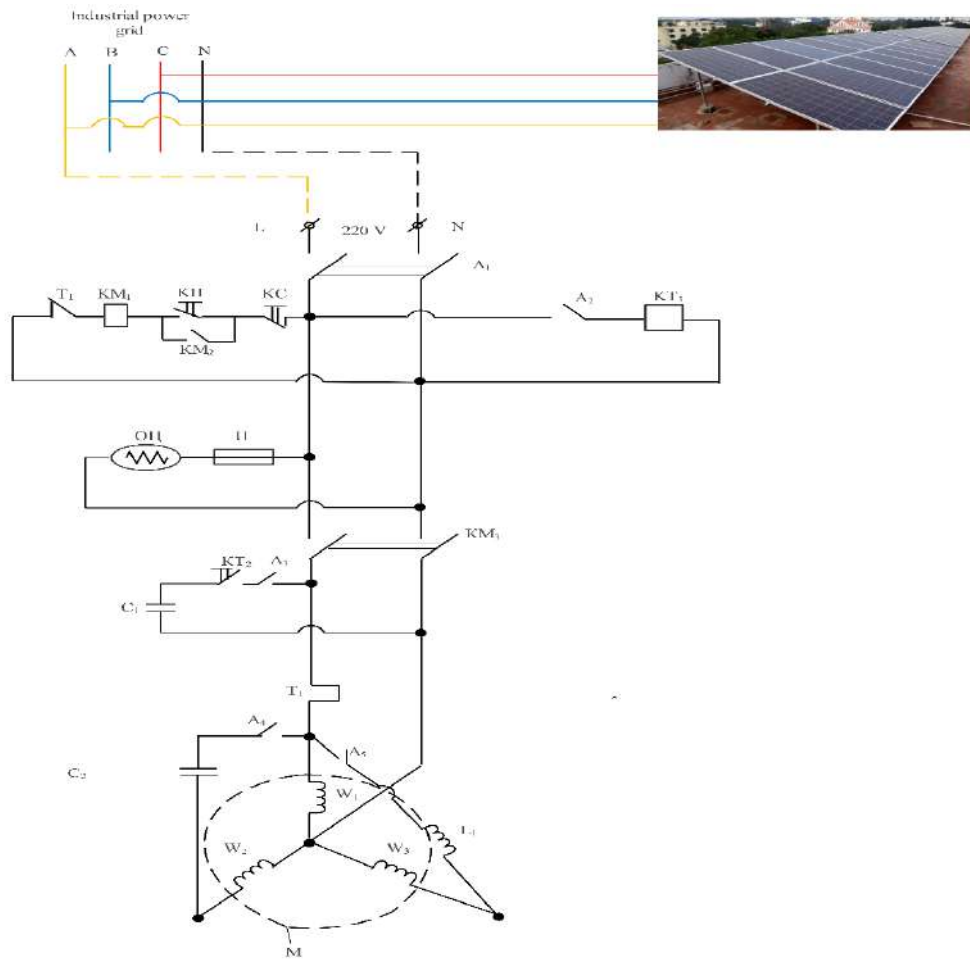


Fig. 1. Research scheme of an asynchronous motor supplied from a single-phase power supply nets

L- one phase of a three-phase power supply nets, N- neutral, A₁,A₂,A₃,A₄,A₅- automatic magnetic circuit breakers, KП- launch button, KС- stop button, KM₁,KM₂- magnetic starters, T₁- thermal relay, KT₁- time relay, C₁- reactive power source (static capacitor battery) C₁ va L₁- capacitive and inductive elements that shift the angle between current and voltage, phase W₁, W₂, W₃- asynchronous motor stator coils, OИ- Oscillograph, П- soluble preservative, M- asynchronous motor.

The principle of placement of the measuring rings of the transformer, which is designed to control and evaluate the symmetrical and non-sinusoidal indicators of the primary current flowing from the stator winding of the asynchronous motor reactive power, and which supplies the secondary signal in the output voltage indicator, is presented in the Fig. 2 [6]:

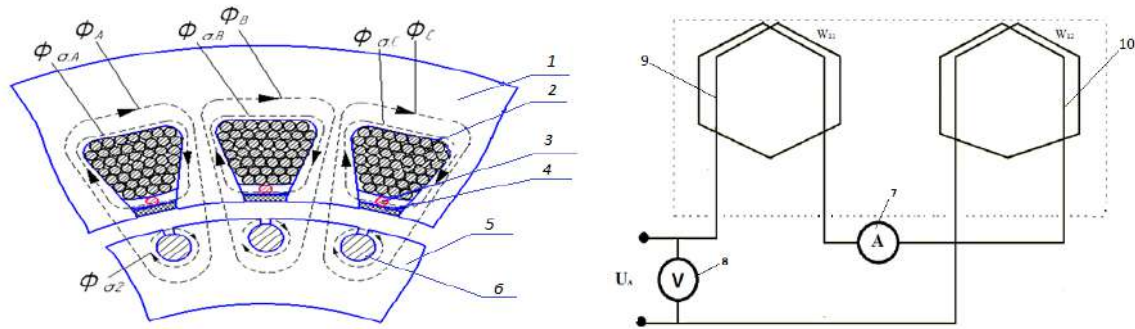


Fig. 2. A scheme that establishes the principle of signal generation based on the placement of sensitive elements in the form of a secondary coil between the stator slots of an asynchronous motor

1 - stationary part of asynchronous motor - stator, 2 - stator coils, 3 - secondary voltage generating coil - location of the sensitive measuring element, 4 - insulating paper, 5 - rotating part of the rotor, 6 - rotor coils, 7 - ammeter, 8 - voltmeter, 9-10 - secondary voltage generating coils - connection diagram of sensitive elements.

W_1 winding consist of two independent winding sections W_{11} and W_{12} installed for each phase, is the common measuring winding A phase primary current flowing from the stator windings of the asynchronous motor secondary voltage (for A phase) U_a , changes to a signal of the form When an asynchronous motor is connected to the network, the output voltage U_a , in the measuring circuit for one phase is determined as follows [7]:

$$U_a = \left(4,44 \cdot f \cdot W_{1A} \cdot \frac{I_A}{R_\mu} \right) W_1$$

Here f is the network frequency,

W_{1A} is the number of stator windings of the asynchronous motor in phase A

$W_1 = W_{11} - W_{12}$ – the number of measuring coils placed in one phase (phase A).

As a result of the primary current flowing through the stator winding, the main Φ_1 and scattered magnetic fluxes $\Phi_{\sigma 1}$ are generated and are expressed as follows:

$$\Phi_{\sigma 1} = \frac{L_\sigma I_1}{w_1}$$

$$\Phi_{\sigma 1} = \frac{L_{\sigma 1.8} I_1}{W_{11}}$$

The stray magnetic flux crosses the measuring coil and creates an output voltage in it, and to study this voltage, its research model is formed as follows:

$$U_a = \sqrt{2}\pi f w_1 \frac{L_\sigma I_A}{w_A}$$

In laboratory conditions, when the load is changed in phase A of a 250 kVA asynchronous motor, the results of the output signal of the measuring element in the measuring devices are presented in Fig. 3.



Fig. 3. The process of receiving a signal from an asynchronous motor and its measuring circuit provided by the energy source produced by solar panels in CAYSLAB laboratory devices

When the asynchronous motor operates from a single-phase network, the output signals from the electromagnetic current converter are measured on the basis of the static descriptions of the graph theory, the number of windings of the sensitive element is proportional to the output signals, and when choosing the sensitive element rings, the stator windings of the asynchronous motor are selected based on the size of the grooves (grooves). Measuring sensitive element rings are required to be fast, accurate, reliable, and have a compact geometric size, while also being able to provide a standard voltage of 5 V [8-14].

The result

The theoretical and practical results of the static description of the output voltage of the electromagnetic current converter for a single-phase asynchronous motor obtained from the results of the research can be seen. The static description of phase A and output voltage of the current transformer placed between the stator wedges and the insulating wedge of the asynchronous motor is presented in Fig. 4.

$$\Delta U_{A\ out} = \frac{U_{pract} - U_{theor.}}{U_{pract}} = \frac{3,85 - 3,84}{3,85} 100\% = 0,2\%$$

The static description of the asynchronous motor was obtained using the CAYSLAB device, and the theoretical values and practical results of the appearance of output signals provided the following asymmetry index:

$$\Delta U_{\text{symmetrical size}} = \frac{\Delta U_{Aout} + \Delta U_{Bout} + \Delta U_{Cout}}{U_{\text{prakt}}} =$$

$$= \frac{0,2 + 0,5 + 0,04}{3} 100\% = 0.7\%$$

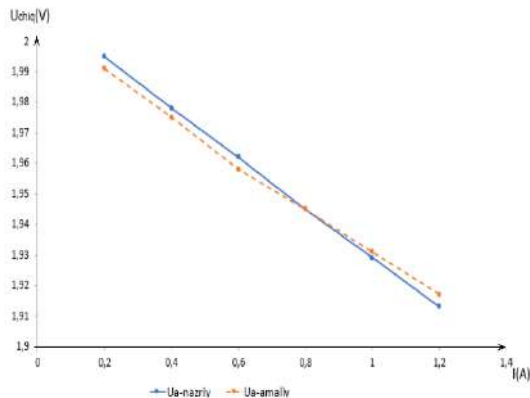


Fig. 4. Static characteristics of the A phase and output voltage of the current transformer placed between the stator wedges and the insulating wedge of the asynchronous motor: a) - output description of the circuit with a capacitor battery, b) - output description of the circuit without a capacitor battery

Discussion

From the obtained results, it can be seen that the developed three-phase current electromagnetic transformer has the advantages of high accuracy, high reliability, compact form and accurate, complete and fast delivery of information compared to classical current transformers. application in asynchronous motors used in households gives positive results.

Summary

Research results show that energy and power losses of asynchronous motors are significantly increased during overloading and when the the affected by temperature, especially after repair, as a result of a sharp increase in its non-symmetry and non-sinusoidal indicators. increase is observed. Considering that asynchronous motors are the most common in practice, measuring and controlling the amount of reactive power consumed by them, controlling three-phase currents through an electromagnetic converter can be a solution to this problem.

The fact that the static description of the current transformer is straight line, it has advantages such as simplicity, accuracy, and compactness over other types

of signal transformers, and it is useful in solving problems in the field of practical application with the workability and suitability of the working environment.

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